Emergency surgical intervention for cranial trauma at birth rarely is necessary today, both because of modern obstetric techniques and because prevailing opinion holds that there are relatively few situations that require it. The following case is being reported since no previous example was found in the literature, and because it seems desirable to call attention to a neurosurgical condition of the newborn that rarely is diagnosed in life, but potentially is correctable by prompt surgery.

CASE REPORT

The patient, S.R., was a full-term baby girl born to a healthy multiparous 29-year-old mother at the Bronx Municipal Hospital Center on March 18, 1961. The membranes ruptured prematurely, precipitating labor with the child in a breech presentation. Breech extraction was accomplished with some difficulty by the use of both forceps and internal and external manipulation. The newborn infant was cyanotic and without spontaneous respiration, but breathing began in response to suctioning and positive-pressure insufflation. She was transferred to the nursery in apparently good condition, where she began to take oral feedings normally. She weighed 3.580 gm. and the circumference of the head was 35 cm.

The following morning, the first postnatal day, the child was noted to have a tense bulging anterior fontanelle, bloody discharge from the nose and mouth, and generalized hypotonia. Subdural taps were negative, but a spinal tap yielded grossly bloody fluid. On the 3rd day, she fed poorly and jaundice appeared which reached its height on the 4th day, when the indirect-reacting serum bilirubin level was greater than 20 mg. per cent. There was no Rh incompatibility, and search for sepsis was negative. By the 6th postnatal day, she had become inactive and stuporous, lying in a frog-like position with the head turned forcefully to the left. She had a weak cry, and absent sucking, grasping, and Moro reflexes. The circumference of the head had increased to 36.3 cm.; repeated subdural taps were again negative. During that day, respirations slowed gradually to 2-3/min., the pupils became small and unreactive, and the child became flaccid and apparently comatose.

Bifrontal burr holes then were made just posterior to the coronal suture and the subdural space was explored. This confirmed the absence of any epi- or subdural fluid or collection of blood, but revealed the brain to be under increased pressure. The wounds were closed and ventriculography was carried out, which demonstrated symmetrically dilated and undisplaced lateral and 3rd ventricles. The 4th ventricle and aqueduct could not be filled with air. As a result of the ventricular decompression, the child improved rapidly, respirations returned to normal, and she became alert. At this time, a transfusion was carried out as well. The following day, the 6th postnatal day, the fontanelle again became tense and her condition deteriorated; operation was undertaken then in hopes of finding a subdural hematoma of the posterior fossa.

The posterior fossa was exposed through a mid-line incision, and included removal of the arch of the atlas. There was no evidence of trauma to the soft tissues, and there were no fractures of the skull. The dura mater over the cerebellum was intact but discolored blue and very tense, and opening it disclosed a thin layer of dark subdural clot. Wider opening of the dura mater allowed for a hematoma about the size of a pigeon’s egg to deliver itself under pressure from the substance of a lacerated and contused cerebellum, predominantly the left hemisphere. Both cerebellar tonsils were wedged tightly alongside of the medulla and upper cervical cord. They were swollen and infarcted and were removed as well. In the 4th ventricle was an adherent blood clot which could be removed only partially; a routine closure then was accomplished.

Postoperatively, the child’s neurological status was much improved, with good respiration and some spontaneous movement. The convalescence was complicated by both bronchopneumonia and atelectasis, requiring repeated endotracheal and bronchosopic aspiration. There was separation, without apparent infection, of the lower portion of the wound of the neck, which healed unevenly. The fontanelle remained soft and she gradually became more alert. As there were no sucking or swallowing reflexes present, she was fed by tube, but normal feeding finally began spontaneously at the end of the 1st postoperative month. She was discharged at the end of the 2nd month.

Follow-up approximately 1 year later demonstrated that the child generally is healthy, and normal in height and weight for her age. The circumference of her head was 42.0 cm., placing her definitely below the lowest percentile for her age, however. She also shows excessive irritability, and definite motor and mental retardation, with bilateral spasticity, more pronounced on the left, and a tendency to lie with the head turned to the left. No choreoathetosis was observed.

DISCUSSION

In reports on large autopsy series of newborns dying of cranial trauma at birth, emphasis usually is placed upon (a) tentorial tears, from excessive molding, with avulsion of the veins leading to the
Fig. 1. Three drawings made from actual anatomical specimens, illustrating:

(A) Posterior view of the skull, showing the wide unfused suture between the squamous and condylar portions of the occipital bone; x marks the plane of parasagittal section in the succeeding drawings.

(B) Parasagittal section through the head of a stillborn infant taken about 5 mm. from the mid line, showing molding and inward movement of the occipital squama.

(C) Enlarged view of posterior fossa, showing so-called occipital osteodiastasis, i.e. separation of the posterior intra-occipital synchondrosis, with the lower lip of the squamous portion engaging and lacerating the inferior third of the cerebellar vermis and hemispheres.

straight sinus, or tearing of the straight or lateral sinus, resulting in massive subdural venous bleeding especially into the posterior fossa,\textsuperscript{7,11} and (b) compression and stasis in the Galenic venous system, with hemorrhages into the centrum ovale\textsuperscript{5,14} or ventricles.\textsuperscript{3} Actual lacerations, contusions, or hematomas involving the cerebrum itself are comparatively rare, and of the cerebellum, rarer still.

von Reuss,\textsuperscript{12} however, mentioned hemorrhage in the region of the medulla oblongata resulting from separation of the supra-occipital and condylar portions of the occipital bone following excessive fronto-occipital compression, but found it rare; and Potter\textsuperscript{11} also referred to suboccipital fractures, noting that they are rare except in breech deliveries with hyperextension of the spine and also invariably fatal. In a review of 10 cases of cerebellar apoplexy, Michael\textsuperscript{8} described 1 case of an infant who began vomiting 10 days after birth and died 3 weeks later from increased intracranial pressure. At autopsy the infant had a right-sided cerebellar hematoma and secondary internal hydrocephalus.

The most detailed examination of this problem was carried out by Hemsath,\textsuperscript{4} who reported on 32 autopsied cases in which there was what he called occipital osteodiastasis or separation of the posterior intra-occipital synchondrosis. He demonstrated an overriding deformity in which the squamous portion of the occipital bone bent inward and upward into the posterior fossa, while the condylar portion remained fixed. Of his 32 patients, 12 had gross cerebellar trauma, and most of the others showed at least a groove across the inferior vermis and lower third of the cerebellar hemispheres. He believed that this condition is an important cause of neonatal mortality since it compromises the cerebellum and medulla, but frequently is overlooked in favor of more obvious lesions, such as tentorial tears, etc. In 48 per cent of his cases the condition resulted from breech deliveries, in which he believed the essential mechanism was compression of the occiput under the maternal symphysis. Of his 32 patients, 26 were stillborn or lived less than 1 hour, and the longest survival was 4 days. This mechanism offers the most satisfactory explanation for the present case, and is illustrated in Fig. 1.

Regarding acute cranial trauma at birth, comparatively little interest has been manifested in correlating the autopsy findings with the clinical picture, or with making a specific, localized diagnosis during life with a view to planning treatment, since most of these infants die at birth or soon after and generally are regarded as hopeless. Operative treatment for such conditions has a long history, however, beginning in 1905, when Cushing\textsuperscript{4} reported 4 cases of acute subdural hematomas in newborns treated by craniotomy and operative removal; 2 died, but 2 made good recoveries, and the author made a plea for early diagnosis and operative treatment, both to permit survival in the acutely ill infants, and to prevent late deficits in cases of lesser urgency. A number of related reports have appeared subsequently, but in a comparatively recent appraisal of the situation by Schipke et al.,\textsuperscript{13} the authors concluded, after adding several cases of their own and reviewing the literature, that the proper treatment of acute (as opposed to chronic) subdural hematomas at birth is by subdural tap only, and that craniotomy is unnecessary.

Reports of other traumatic neurosurgical conditions requiring operation in the early postnatal period are surprisingly rare, but include a case of epidural hematoma from a fracture at birth, operated upon at age 3 weeks;\textsuperscript{3} a case of chronic subdural hematoma of the posterior fossa operated